

NHS BLOOD AND TRANSPLANT
CARDIOTHORACIC ADVISORY GROUP
REVIEW OF HEART ALLOCATION SCHEMES

SUMMARY

INTRODUCTION

- 1 On 26 October 2016, the Super-Urgent Heart Allocation Scheme (SUHAS) was introduced and at the same time, the listing criteria for the Urgent Heart Allocation Scheme (UHAS) was altered. Some patients who may have previously qualified for the UHAS are now registered in the Non-Urgent Heart Allocation Scheme (NUHAS). This report presents a review of all three schemes over the 12 month period, 26 October 2016 to 25 October 2017.

KEY RESULTS

Registration data

- 2 During the 12 month period there have been 58 (15%) adult registrations onto the SUHAS, 152 (38%) onto the UHAS and 187 (48%) onto the NUHAS. Additionally, there have been 44 (69%) paediatric registrations onto the UHAS and 19 (30%) onto the NUHAS. At any given time there are usually fewer than 5 patients active on the SUHAS, which has remained stable, but there has been a large increase in the number of patients on the UHAS from 16 at end-Oct 2016 to 42 at end-Sep 2017. Median waiting time to heart transplant was 52 days and 9 days, for adult patients in the UHAS and SUHAS respectively, and 111 days for paediatric patients in the UHAS. Mortality on the waiting list was $\leq 4\%$ across all schemes for adult patients, but was higher for paediatric patients in the UHAS, at 20%.

Offering data

- 3 Hearts from 552 adult donors and 14 paediatric donors were offered during the time period. Overall, 161 (29%) adult donor hearts and 10 (71%) paediatric donor hearts were accepted and used. For adult hearts offered in the different schemes, the acceptance rates were as follows: 37/296 (13%) in the SUHAS, 90/462 (19%) in the UHAS, and 34/329 (10%) in the NUHAS.

Transplant data

- 4 There was a 10% decrease in the total number of heart transplants performed in 26 October 2016 to 25 October 2017 compared with the equivalent period of the previous year, from 207 to 186. The 186 transplants comprise 38 non-urgent (20%), 109 urgent (59%), and 39 super-urgent (21%). In the previous year, 16% of transplants were non-urgent (i.e. a slight increase this year). There have been 27 post-transplant deaths reported; 5 in the non-urgent group, 16 urgent and 6 super-urgent. The 30 day post-transplant survival rates for adult recipients in the SUHAS, UHAS and NUHAS were comparable, at 94.6%, 92.1% and 93.9%, respectively.

ACTION

- 5 This report is an evaluation of the first 12 months of the new heart allocation schemes. It shows, broadly, that the new super-urgent tier allows quick access to transplantation for the most clinically urgent patients without compromising short-term transplant outcomes. Members are asked comment on any areas of concern.

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REVIEW OF HEART ALLOCATION SCHEMES

INTRODUCTION

- 1 On 26 October 2016, the Super-Urgent Heart Allocation Scheme (SUHAS) was introduced. After an initial review of the scheme, in July 2017, an adjustment was made to remove automatic access to the SUHAS for patients with intra-aortic balloon pumps (IABP). These patients now require approval from the CTAG Adjudication Panel in order to be listed on the SUHAS, but do have automatic access to the Urgent Heart Allocation Scheme (UHAS).
- 2 At the same time as introducing the SUHAS, the listing criteria for the UHAS was altered, and some patients who may have previously qualified for the UHAS are now registered in the Non-Urgent Heart Allocation Scheme (NUHAS). The SUHAS is open to adult patients only (age \geq 16 years), while the UHAS and NUHAS are open to both adult and paediatric patients.
- 3 This report presents a review of the SUHAS, UHAS and NUHAS over the 12 month period, 26 October 2016 to 25 October 2017. Data on registrations into the three schemes were analysed, as well as donor heart offering data and transplant data.

DATA AND METHODS

- 4 The registration data that were extracted included all adult and paediatric patients that had been placed onto the SUHAS, UHAS or NUHAS between 26 October 2016 and 25 October 2017. Any heart-lung block registrations were excluded (these are reported separately in **CTAGS(18)04 – Heart-Lung Transplant Outcomes**). Each individual registration was counted, so for example, if a patient went from the NUHAS to the UHAS during the time period, both registrations were counted as separate observations. Registration outcomes (i.e. transplantation, removal, moved to another scheme, death, or still waiting) and waiting times were extracted from the UK Transplant Registry (UKTR) on 12 April 2018.
- 5 All UK adult and paediatric DBD consented potential donors whose heart was offered between 26 October 2016 and 25 October 2017 were extracted. Offering data recorded by Hub Operations were used to track the offering pathway for each donor and the results were summarised. Note that from July 2017 all offers in the NUHAS have been simultaneously group offered, whereas offers to patients in the SUHAS and UHAS are individual, patient-specific offers. See the Heart Allocation Policy for full details of the offering schemes <https://nhsbtddb.blob.core.windows.net/umbraco-assets-corp/6524/pol228-heart-allocation.pdf>. Note also that between September and December 2017, the task of making cardiothoracic organ offers was moved over from Specialist Nurses in Organ Donation (SNODs) to Hub Operations.
- 6 All heart transplants (excluding heart-lung blocks) performed by each UK centre between 26 October 2016 and 25 October 2017 were extracted. Post-transplant survival data for these transplants were analysed, as recorded on the UKTR on 16 April 2018.

RESULTS

Registration data

- 7 The number of patient registrations made by each centre onto each scheme, during the 12 month analysis period, is shown in **Table 1**. Note that each individual registration is counted, so if a patient that was registered in more than one scheme during the time period they are counted more than once. The number of patients is shown in the far right column.

Centre	Urgency category						Total N	Number of patients
	Non-urgent		Urgent		Super-urgent			
	N	%	N	%	N	%		
Adult								
Birmingham	22	39	28	49	7	12	57	44
Glasgow	12	41	5	17	12	41	29	24
Harefield	50	46	42	39	17	16	109	86
Manchester	22	50	15	34	7	16	44	40
Newcastle	49	58	33	39	2	2	84	60
Papworth	32	43	29	39	13	18	74	55
Total	187	47	152	38	58	15	397	309
Paediatric								
Great Ormond Street	12	34	22	63	1	3	35	25
Newcastle	7	24	22	76	0	0	29	26
Total	19	30	44	69	1	2	64	51
TOTAL	206	45	196	43	59	13	461	360

- 8 **Table 2** shows the breakdown of urgent and super-urgent registrations in each registration category. The most common urgent category was 21 - Adult inpatient dependent on intravenous inotropes (now including and/or IABP) which cannot be weaned, representing 77% of urgent adult registrations. The most common super-urgent category was 11 - Adult patient on temporary ventricular assist device (VAD) or extra-corporeal membrane oxygenation (ECMO) support (now excluding IABP), representing 90% of adult super-urgent registrations. Full details of the different categories can be found in the Heart Selection Policy https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/7758/pol229_5_2-heart-selection-policy.pdf.

Table 2 Number of urgent and super-urgent registrations under each category, between 26 October 2016 and 25 October 2017, by centre

	Adult categories			Urgent Paediatric categories					88	Total	Super-Urgent				
	21	22*	23*	51	54	55	56	59*			11	12*	21	88	Total
Adult															
Birmingham	23	5	0	0	0	0	0	0	0	28	7	0	0	0	7
Glasgow	4	0	1	0	0	0	0	0	0	5	11	0	1	0	12
Harefield	25	14	0	0	0	3	0	0	0	42	16	1	0	0	17
Manchester	12	1	2	0	0	0	0	0	0	15	6	0	1	0	7
Newcastle	28	4	0	0	0	1	0	0	0	33	0	1	1	0	2
Papworth	25	3	1	0	0	0	0	0	0	29	12	0	1	0	13
Total	117	27	4	0	0	4	0	0	0	152	52	2	4¹	0	58
Paediatric															
GOSH	0	0	0	4	1	4	4	5	4 ²	22	0	0	0	1	1
Newcastle	2	0	0	5	4	6	4	1	0	22	0	0	0	0	0
Total	2	0	0	9	5	10	8	6	4	44	0	0	0	1	1
Total	119	27	4	9	5	14	8	6	4	196	52	2	4	1	59

¹ It is known that one of these registrations (at Newcastle) had approval from CTAG Adjudication Panel, no evidence was found for the other three

² Could not find category

* Approval for listing required from CTAG Adjudication Panel – see **Table 3**

9 **Table 3** details the number of registrations under categories that require prior approval from the CTAG Adjudication Panel, and the number where evidence of approval was found.

Table 3 Number of registrations under urgent and super-urgent categories that require CTAG Adjudication Panel approval and number where evidence of approval was found

	22 ¹		23		12	
	Number of registrations	Number approved	Number of registrations	Number approved	Number of registrations	Number approved
Adult						
Birmingham	5	0	0	-	0	-
Glasgow	0	-	1	1	0	-
Harefield	14	3	0	-	1	1
Manchester	1	1	2	2	0	-
Newcastle	4	3	0	-	1	1
Papworth	3	0	1	1	0	-
Total	27	7	4	4	2	2
Paediatric						
		59				
GOSH	5	2				
Newcastle	1	1				
Total	6	3				

¹ Registration form has now been altered (Jan 2018) to clarify that for all patients in this category approval is needed (previously form only stated that those with recurrent or refractory VAD/TAH thrombosis needed approval)

- 10 **Table 4** summarises the number of applications made the CTAG Heart Adjudication Panel between 26 October 2016 and 25 October 2017 and the results of these requests. The clinical details submitted for each patient are included in **Appendix (removed as patient identifiable)**.

Centre	Number of applications	Number approved	Number rejected	Outcome unknown	Notes (removed as patient identifiable)
Adult					
Birmingham	0	-	-	-	
Glasgow	3	2	1	0	
Harefield	3	2	1	0	
Manchester	4	4	0	0	
Newcastle	5	4	1	0	
Papworth	3	2	1	0	
Total	18	14	4	0	
Paediatric					
GOSH	3	3	0	0	
Newcastle	1	1	0	0	
Total	4	4	0	0	
TOTAL	22	18	4	0	

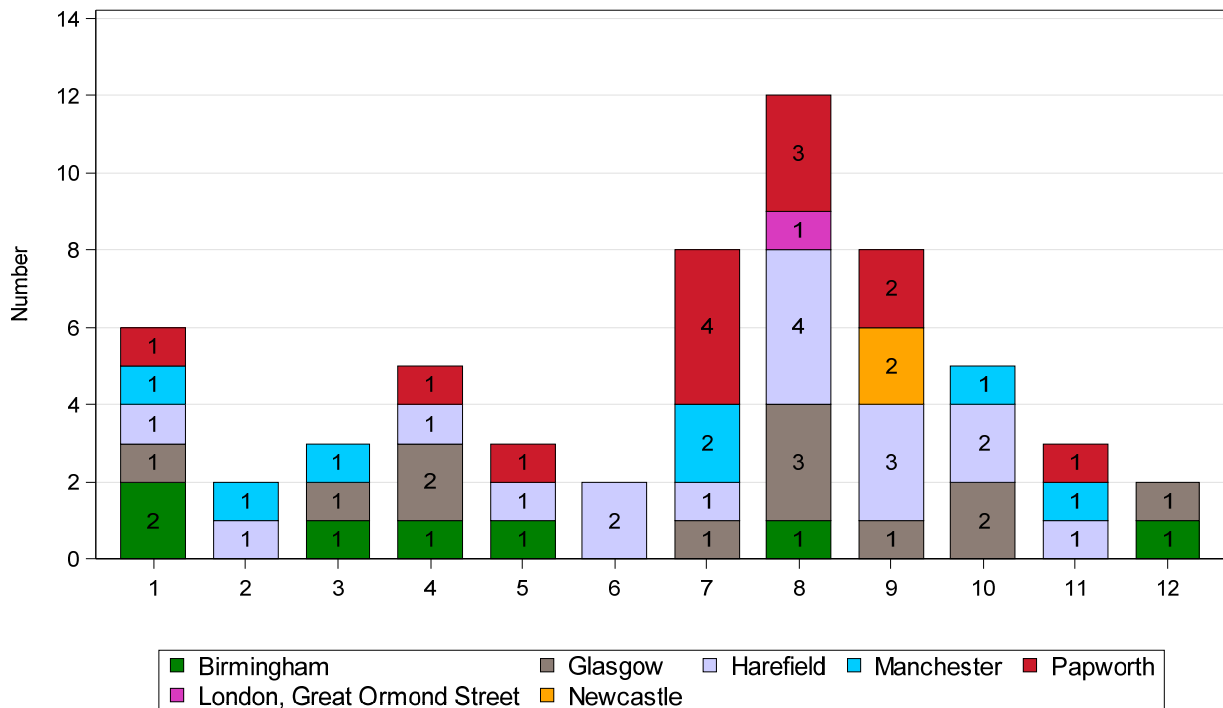
- 11 **Figure 1** shows the number of registrations onto the UHAS per month over the 12 month period, by centre (where month 1 is 26 October 2016 – 25 November 2016 for example).

Figure 1 Number of adult and paediatric registrations onto the UHAS, by month and transplant centre



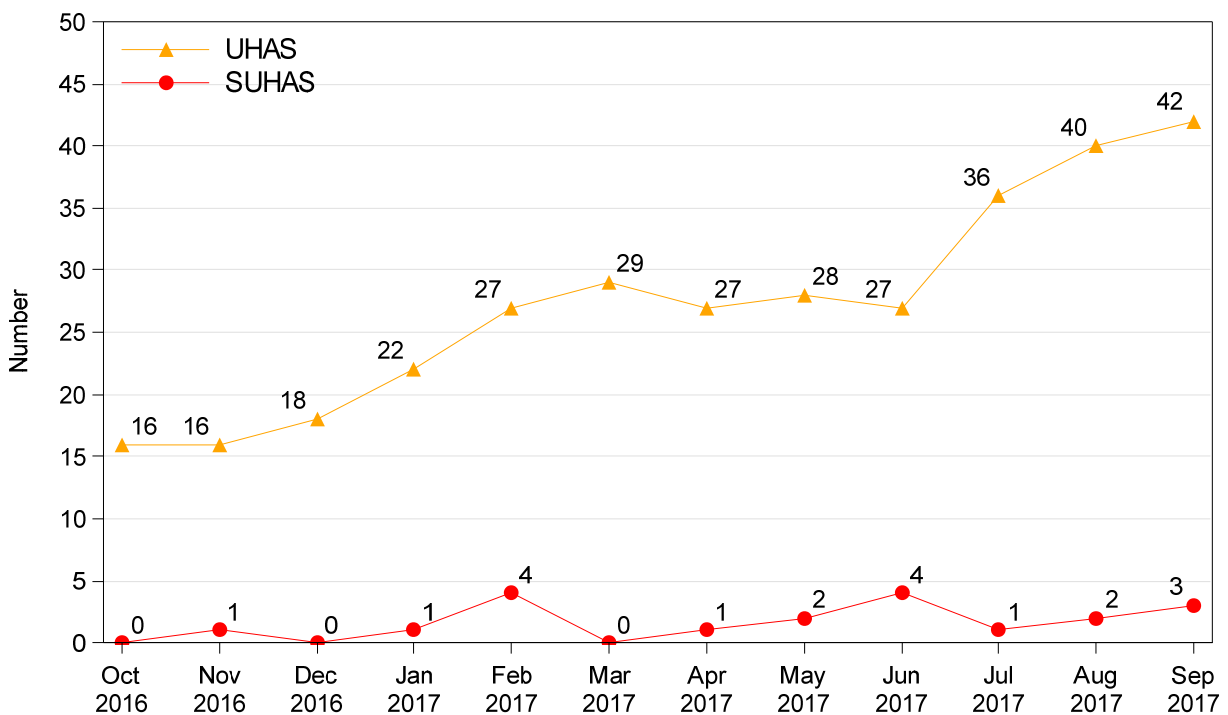
- 12 **Figure 2** shows the monthly trend in SUHAS registrations. Note that July 2017, when the agreement was made for IABP patients to not have automatic access to the SUHAS, corresponds with month 9.

Figure 2 Number of adult and paediatric registrations onto the SUHAS, by month and transplant centre



- 13 **Figure 3** shows the number of adult and paediatric patients active on the UHAS and SUHAS at the end of each month between October 2016 and September 2017. The number of patients on the UHAS has risen by 163%.

Figure 3 Number of adult and paediatric patients active on the SUHAS and UHAS at the end of each month



- 14 **Table 5** shows the median waiting time to transplant in the different schemes and **Table 6** shows the outcomes of patient registrations in the different schemes, by centre, as at 12 April 2018. The transplantation rate is much higher in the UHAS and SUHAS than in the NUHAS. The waiting list mortality rate in adults is similar between schemes (2-4%), however for urgent paediatric patients it is relatively high; 20% of registrations ended in death (9 patients). Moreover, median time to urgent paediatric transplantation was much higher than for urgent adult transplantation; 111 days vs 52 days. Median waiting time to super-urgent heart transplantation was just 9 days. For reference, median waiting time to urgent adult heart transplantation before the introduction of the SUHAS was 26 days (*Annual Report on Cardiothoracic Organ Transplantation 2016/17, NHS Blood and Transplant*).

Table 5 Median waiting time to heart transplantation across each of the Heart Allocation Schemes for patients registered 26 October 2016 – 25 October 2017				
Scheme	Number of registrations	Number of transplants as at 12 April 2018 (%)	Waiting time (days)	
			Median	95% Confidence interval
Adult				
NUHAS ¹	187	30 (16%)	-	-
UHAS	152	102 (67%)	52	38 – 66
SUHAS	58	42 (72%)	9	6 – 12
Overall	397	174 (44%)	204	116 – 292
Paediatric				
NUHAS ¹	19	7 (37%)	-	-
UHAS	44	23 (52%)	111	25 – 197
Overall²	64	30 (47%)	151	55 – 247

¹ Not possible to estimate a median
² One registration was super-urgent, which has been excluded, hence why the NUHAS and UHAS totals do not add up to overall total

Table 6 Outcomes of patient registrations onto each of the Heart Allocation Schemes, between 26 October 2016 – 25 October 2017, as at 12 April 2018

Centre	Non-urgent												Urgent												Super-urgent											
	Became S-U		Became U		Died		Remov- ed		Still waiting		Transpl- anted		Total	Became S-U		Became N-U		Died		Remov- ed		Still waiting		Transpl- anted		Total	Became U		Died		Remov- ed		Transpl- anted		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	N	N	%	N	%	N	%	N	%	N	%	N	N	N	%	N	%	N	%	N	N		
Adult																																				
Birmingham	0	0	1	5	1	5	6	27	12	55	2	9	22	1	4	0	0	0	0	11	39	0	0	16	57	28	0	0	1	14	0	0	6	86	7	
Glasgow	0	0	1	8	0	0	0	0	11	92	0	0	12	3	60	0	0	0	0	0	0	0	0	2	40	5	0	0	1	8	1	8	10	83	12	
Harefield	1	2	9	18	0	0	6	12	28	56	6	12	50	3	7	0	0	1	2	8	19	3	7	27	64	42	0	0	0	0	10	59	7	41	17	
Manchester	0	0	2	9	1	5	1	5	14	64	4	18	22	1	7	0	0	0	0	2	13	0	0	12	80	15	0	0	0	0	1	14	6	86	7	
Newcastle	0	0	12	24	3	6	2	4	30	61	2	4	49	2	6	1	3	2	6	6	18	0	0	22	67	33	0	0	0	0	0	0	2	100	2	
Papworth	1	3	9	28	2	6	0	0	4	13	16	50	32	2	7	0	0	0	0	4	14	0	0	23	79	29	0	0	0	0	2	15	11	85	13	
Total	2	1	34	18	7	4	15	8	99	53	30	16	187	12	8	1	1	3	2	31	20	3	2	102	67	152	0	0	2	3	14	24	42	72	58	
Paediatric																																				
GOSH	0	0	5	42	0	0	0	0	4	33	3	25	12	0	0	2	9	4	18	3	14	3	14	10	45	22	1	100	0	0	0	0	0	0	1	
Newcastle	0	0	1	14	0	0	0	0	2	29	4	57	7	0	0	0	0	5	23	3	14	1	5	13	59	22	0	-	0	-	0	-	0	-	0	
Total	0	0	6	32	0	0	0	0	6	32	7	37	19	0	0	2	5	9	20	6	14	4	9	23	52	44	1	100	0	0	0	0	0	0	1	
TOTAL	2	1	40	19	7	3	15	7	105	51	37	18	206	12	6	3	2	12	6	37	19	7	4	125	64	196	1	2	2	3	14	24	42	71	59	

15 **Figure 4** and **Figure 5** represent the data in **Table 6** in graphical form, for adult and paediatric patients respectively. Note that of the 21 patients that died on the list, cause of death was not well reported; in two cases multi-system failure was reported and in two cases intracranial haemorrhage was reported.

Figure 4 Percentage of adult registrations in each Heart Allocation Scheme ending in death, transplant or still waiting/removed, as at 12 April 2018, by centre and for the UK

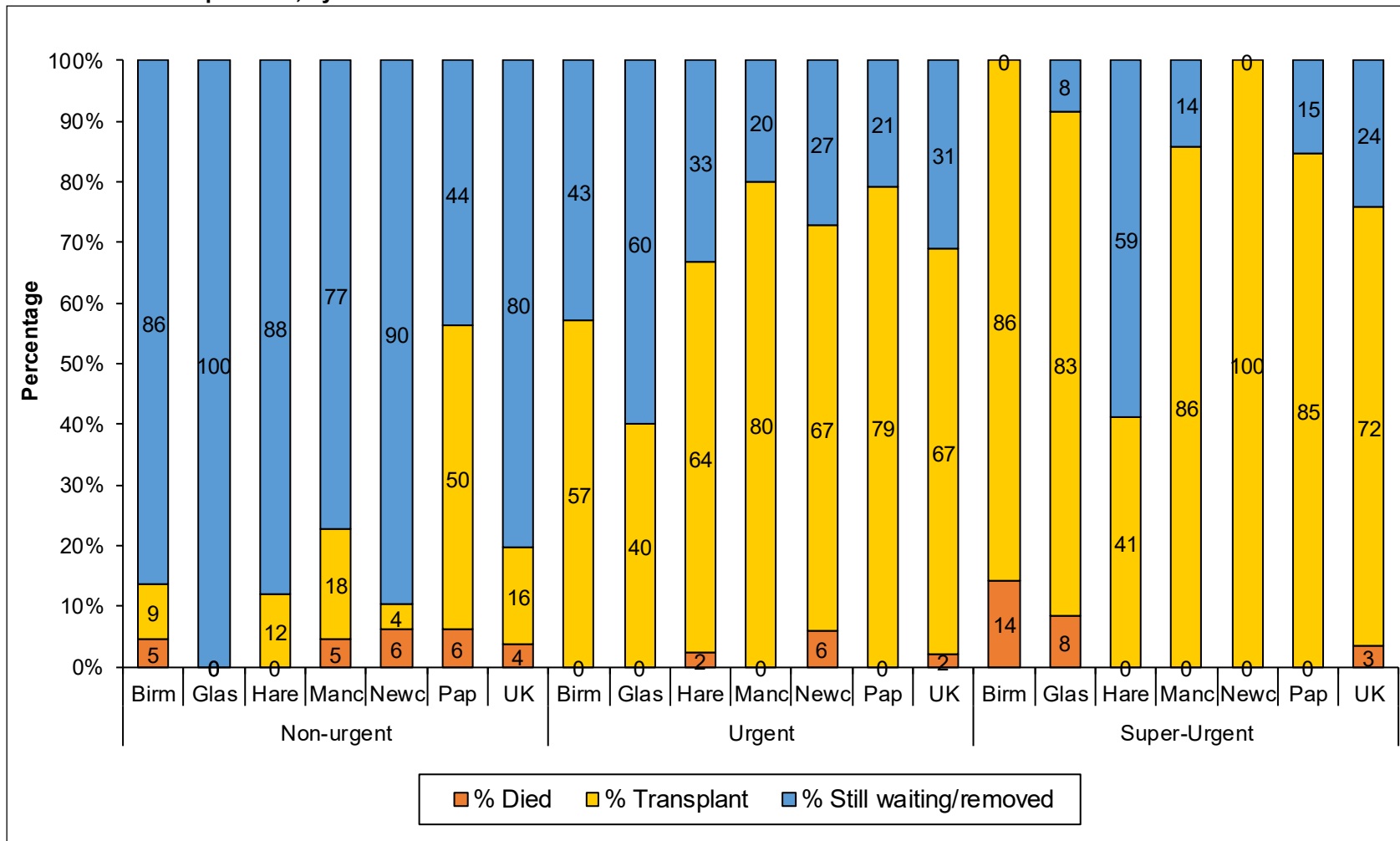
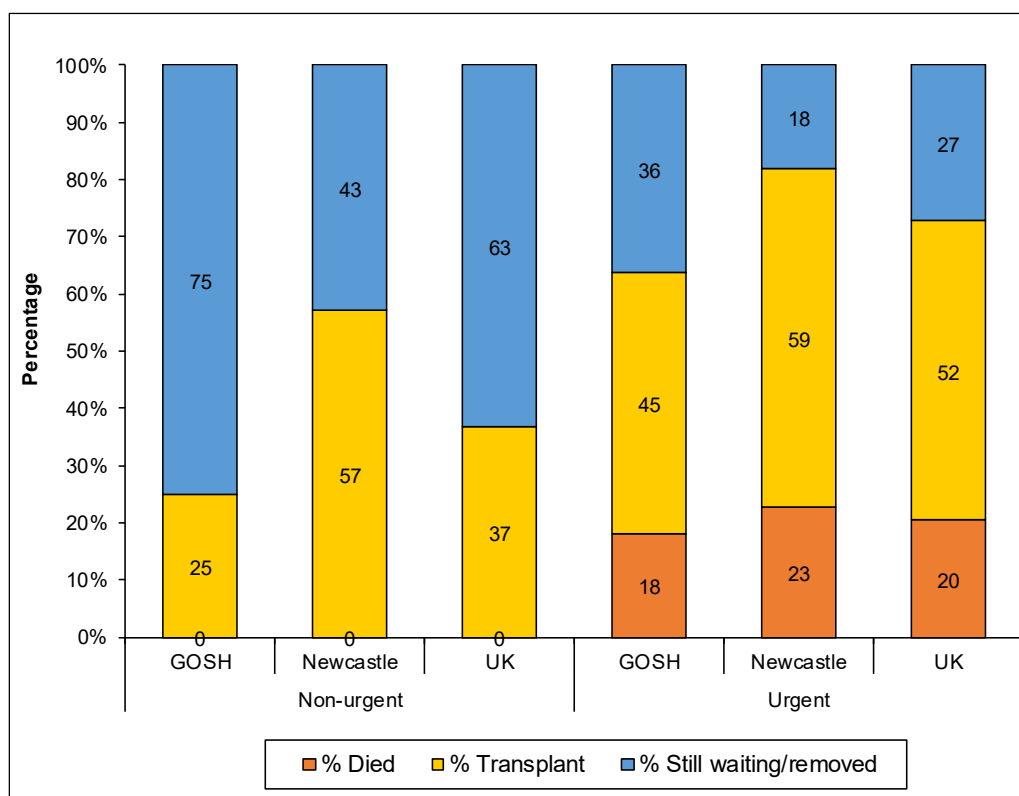


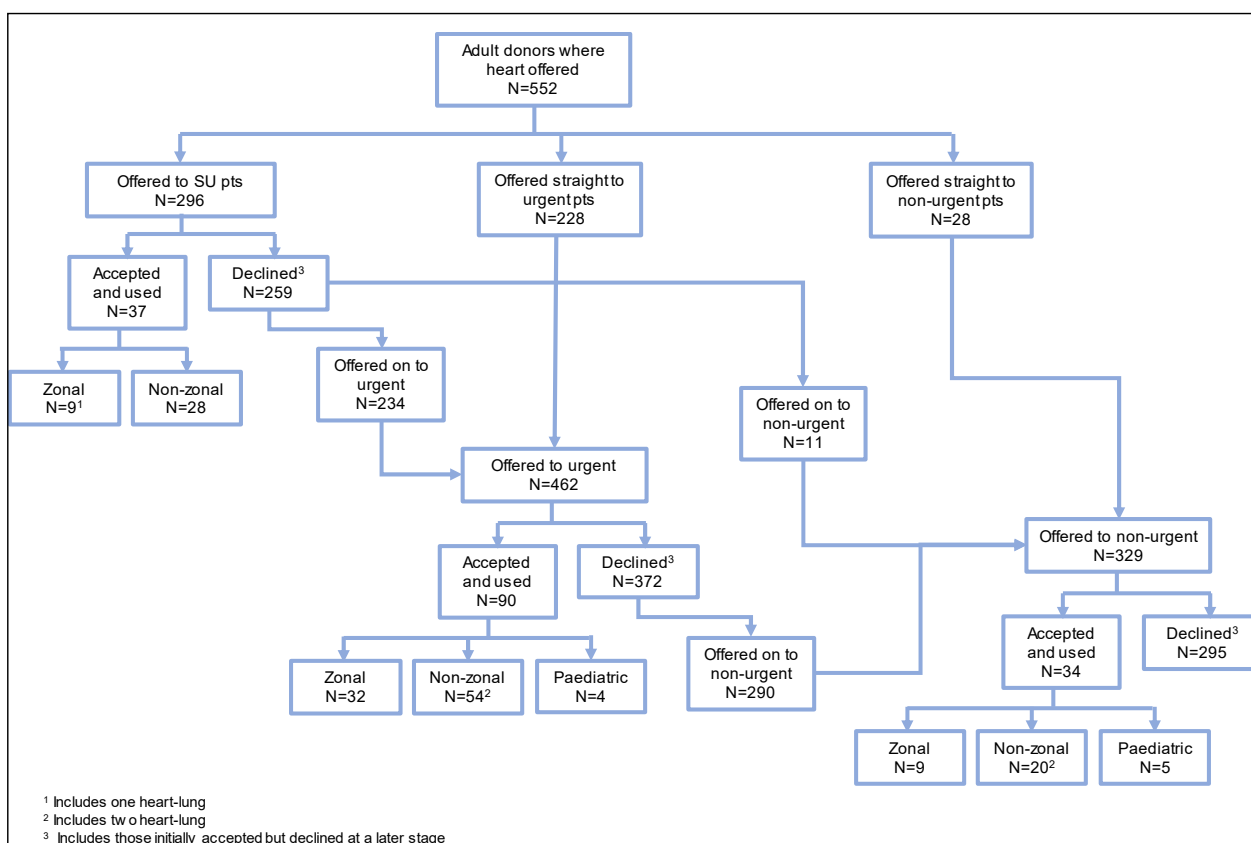
Figure 5 Percentage of paediatric registrations in each Heart Allocation Scheme ending in death, transplant or still waiting/removed, as at 12 April 2018, by centre and for the UK



Offering data

- 16 **Figure 6** and **Figure 7** show flow diagrams of DBD donor hearts offered by Hub Operations and SNODs in the 12 month analysis period, for adult and paediatric donors respectively. Note that this analysis classes heart offers that were withdrawn as not offered. Note that the analysis excludes DCD hearts.
- 17 There were only 14 paediatric donors offered during the time period, compared with 552 adult donors. 37 adult donors were accepted and used for super-urgent patients, 90 for urgent patients, and 34 for non-urgent patients.

Figure 6 Flow diagram of UK adult (age≥16) donor heart offering in 12 months between 26 October 2016 and 25 October 2017



- 18 **Table 7** shows a summary of the primary reasons for non-use as recorded by Hub Operations, for the 391 adult donors (295 + 14 not offered on after super-urgent offering + 82 not offered on after urgent offering) that were declined and the 4 paediatric donors (3 + 1 not offered on after super-urgent offering) that were declined. The most common reasons recorded were poor function and the past history of the donor.

Figure 7 Flow diagram of UK paediatric (age<16) donor heart offering in 12 months between 26 October 2016 and 25 October 2017

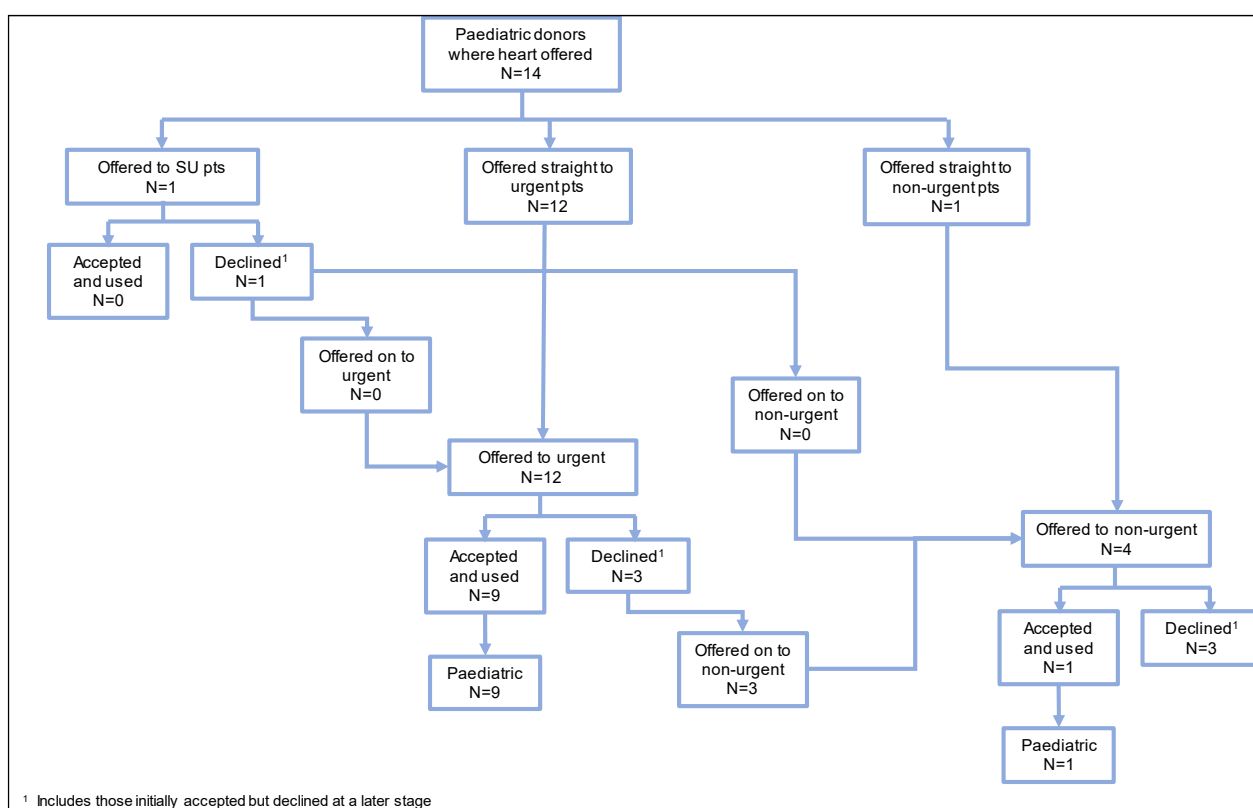


Table 7 Reasons for non-use of adult and paediatric donor hearts offered from potential deceased donors between 26 October 2016 and 25 October 2017

Primary reason recorded for non-use	Adult	Paediatric	Total
Poor function	159	1	160
Donor unsuitable - past history	97	0	97
Donor unsuitable - size	41	1	42
Donor unsuitable - age	31	0	31
Other	20	0	20
No suitable recipients	16	0	16
Other disease	8	0	8
Donor unsuitable - virology	8	0	8
HLA/ABO type	2	1	3
Donor unstable	1	1	2
Used for research after declined by centres	2	0	2
Consent withdrawn	1	0	1
Donor unsuitable - cod	1	0	1
Tumour	1	0	1
Organ damaged	1	0	1
Ischaemia time too long - cold	1	0	1
Organ used elsewhere	1	0	1
Total	391	4	395

Transplants

- 19 **Table 8** shows the number of heart transplants performed in each urgency group in the 12 month period, by centre. Heart-lung block transplants are excluded. It also provides a comparison with the equivalent time period of the previous year. Overall, heart transplant activity has dropped by 10%. The overall proportion of transplants carried out in non-urgent patients has increased slightly from 16% to 20%.

Centre	26 October 2016 – 25 October 2017							26 October 2015 – 25 October 2016 ¹					% change
	Non-urgent		Urgent		Super-urgent		Total	Non-urgent		Urgent		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	
Adult													
Birmingham	0	0	16	76	5	24	21	1	4	25	96	26	-19%
Glasgow	2	14	3	21	9	64	14	1	9	10	91	11	+27%
Harefield ²	5	16	20	63	7	22	32	2	8	22	92	24	+33%
Manchester	6	30	9	45	5	25	20	2	7	25	93	27	-26%
Newcastle	4	16	19	76	2	8	25	3	12	22	88	25	0%
Papworth	16	33	22	45	11	22	49	22	42	31	58	53	-8%
Total	33	20	89	55	39	24	161	31	19	135	81	166	-3%
Paediatric													
Great Ormond Street	3	27	8	73	-	-	11	2	12	15	88	17	-35%
Newcastle	2	14	12	86	-	-	14	1	4	23	96	24	-42%
Total	5	20	20	80	-	-	25	3	7	39	93	42	-40%
TOTAL	38	20	109	59	39	21	186	34	16	173	84	207	-10%

¹ Includes one heart-kidney transplant
² Includes two paediatric recipients (age<16)

- 20 **Table 9** shows the number of post-transplant deaths for patients in each scheme, out of the 186 transplants in the 12 month period and **Table 10** shows the causes of deaths reported to the UKTR for the 27 deaths.

Scheme	Alive	Dead	Unknown	Total
Adult				
NUHAS	28	5	0	33
UHAS	75	14	0	89
SUHAS	33	6	0	39
Total	136	25	0	161
Paediatric				
NUHAS	5	0	0	5
UHAS	17	2	1	20
Total	22	2	1	25
TOTAL	158	27	1	186

	Non-urgent	Urgent	Super-urgent	Total
Adult				
Cerebro-vascular accident	0	0	1	1
Infections elsewhere (except viral hepatitis)	0	0	1	1
Lymphoid malignant disease possibly induced by immunosuppressive therapy	0	1	0	1
Early graft dysfunction	1	1	1	3
Multi-system failure	1	7	0	8
Donor organ failure	1	0	0	1
Other identified cause of death	2	3	2	7
Unknown	0	2	1	3
Total	5	14	6	25
Paediatric				
Multi-system failure	0	1	-	1
Other identified cause of death	0	1	-	1
Total	0	2	-	2
TOTAL	5	16	6	27

- 21 **Figure 8** shows an analysis of patient survival after transplantation for patients in the different schemes. This includes adult patients only and excludes re-transplantations. Transplants performed in the 12 month time period, 26 October 2015 to 25 October 2016, are included for comparison.

Figure 8 30 day Kaplan-Meier patient survival curves for adult patients transplanted in different urgency groups, (a) 26 October 2015 – 25 October 2016 (b) 26 October 2016 – 25 October 2017

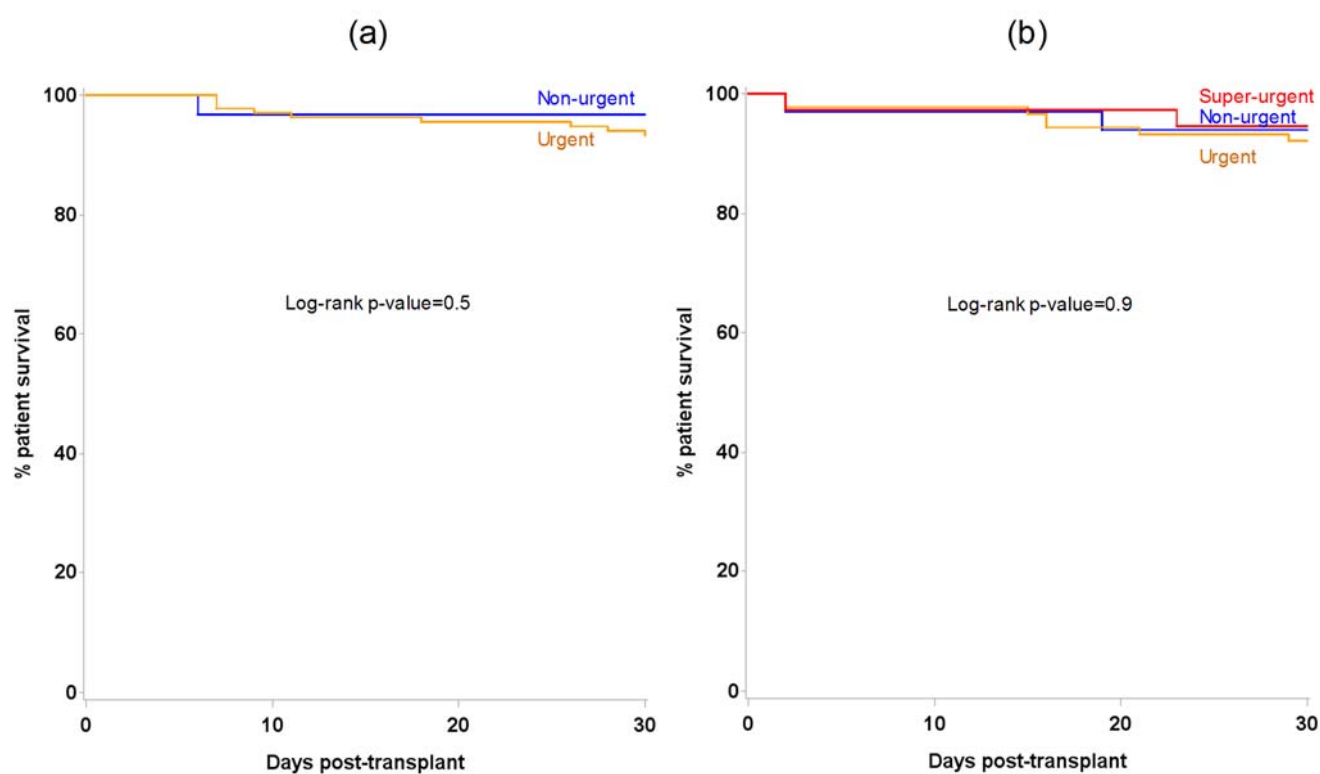


Table 11 30 day patient survival rates following heart transplantation across the Heart Allocation Schemes for patients transplanted 26 October 2016 – 25 October 2017 and compared with previous year

Scheme	Number of transplants	Number of deaths within 30 days	30 day survival %	95% Confidence interval
26/10/16-25/10/17	159	11	93.1	87.9 – 96.1
NUHAS	33	2	93.9	77.9 – 98.5
UHAS	89	7	92.1	84.2 – 96.2
SUHAS	37	2	94.6	80.1 – 98.6
26/10/15-25/10/16	165	10	93.9	89.0 – 96.7
NUHAS	31	1	96.8	79.2 – 99.5
UHAS	134	9	93.3	87.5 – 96.5